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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/721,713	11/25/2003	Ioana M. Boier-Martin	YOR920030614US1	6291

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EXAMINER	
CRAIG, DWIN M	

ART UNIT	PAPER NUMBER
2123	

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11/16/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/721,713	BOIER-MARTIN ET AL.	
	Examiner	Art Unit	
	Dwin M. Craig	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 10-17* is/are rejected.

7)☒ Claim(s) *9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-17 have been presented fore reconsideration based on Applicants' arguments and amended claim language.

Response to Arguments

2. Applicants' arguments presented in the 8/23/2007 responses have been fully considered; the Examiner's response is as follows:

2.1 Regarding Applicants' response to the 35 U.S.C. 101 rejections of claims 1-17, the combination of Applicants' instant amendments and arguments have been persuasive as regards claims 7-15 and the Examiner withdraws the earlier applied 35 U.S.C. 101 rejections of those claims.

2.2 Regarding claims 1-6, 16 and 17, because independent claims 1, 2 and 16 are claiming a system, the currently claimed systems do not provide the required elements for the systems to actually accomplish a useful, concrete and tangible result as required for 35 U.S.C. 101. The claims are still directed towards non-statutory subject matter, see the rejection in this Office Action.

2.3 Regarding Applicants' response to the 35 U.S.C. 103(a) rejections of claims 1-8 and 10-17, the Examiner respectfully traverses Applicants' arguments. The Examiner will now respond to Applicants' arguments:

On pages 8-10 of the 8/23/2007 responses Applicants opined that the cited references failed to disclose or suggest the claimed limitations as set forth in independent claims 1, 2, 7, 16 and 17 followed in each case by a recitation of the currently claimed limitations.

Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

2.4 On pages 11-14 Applicants' presented arguments that the combination of Hoppe and Stam was improper, the Examiner respectfully traverses Applicants' arguments.

On page 11 Applicants' argued:

With respect to the first assertion of the Applicants, namely that Stam teaches away from Hoppe, the Applicants point out that Hoppe is directed to a "Method and System for View-dependent Refinement of Progressive Meshes" (Hoppe, Title) that involves re- parameterization (i.e., that involves explicit subdivision)(see, e.g., Hoppe, col. 3, lines 14-25, and lines 52-65, respectively disclosing a method and system involving re-parameterization), while Stam is directed to the "Exact Evaluation of Catmull-Clark Subdivision Surfaces at Arbitrary Parameter Values" (Stam, Title) that explicitly proscribes the use of re- parameterization (i.e., that proscribes the use of explicit subdivision)(see, e.g., Stam, Abstract).

Stam does not teach away from Hoppe, Stam clearly teaches "subdivision" the first page clearly teaches, this for example, column 2 lines 23-25 disclose, "In fact, we have implemented a simular technique for Loop's triangular subdivision scheme [5]" and further in column 2 lines 37-39 discloses "In this paper, we show that the eigenbasis of the Catmull-Clark subdivision scheme can be computed analytically", further in column 2 lines 44-46 is disclosed, "Since our eigenbasis functions are analytical, the evaluation of Catmull-Clark subdivision surfaces can be expressed analytically", thus subdivision is clearly supported in Stam and therefore Stam does not *teach away* from Hoppe.

On pages 13 & 14 Applicants' further argued:

"The Applicants point out that the principle of operation of Hoppe is re-parameterization, while the principle of operation of Stare is natural parameterization. Accordingly, the combination of Hoppe and Stam would necessarily involve a change of operation of Hoppe and

Stam, which is prohibited under MPEP §2143.01. Accordingly, the combination formed from such references it improper for at least this reason."

The Examiner respectfully traverses Applicants' argument, after checking *Stam* reference the Examiner was unable to find the phrase *"natural parameterization"* or the word *"natural"* anywhere in *Stam*. It is further noted that both *Stam* and *Hoppe* are directed towards parameterization and there appears to be no real functional difference between how *parameterization* is being performed in either reference.

2.5 Applicants argued on page 15:

"The Applicants respectfully disagree. Stam discloses how to compute derivatives based on the natural parameterization. There is a big difference between simply computing derivatives for computation sake and computing the derivatives in a STABLE WAY (see, e.g., Applicants' specification, p. 11, lines 7-1 I). One problem with computing derivatives based on natural parameterization (versus the claimed approach) is that the derivatives obtained from the Stare approach may "blow up" as one gets close to the vertex, which would render them unusable for any practical purpose. Accordingly, it is respectfully asserted that none of the cited references teach or suggest the above-recited limitations of Claim 3."

The Examiner respectfully traverses Applicants' arguments, Applicants' are arguing terminology and definitions that are not in the actual claim language, for example the phrase, *"natural parameterization"* does not appear in the current claim language, further the phrase, *"STABLE"* is not in the current claim language, further the Examiner notes that the derivatives computer in *Stam* are not being computed for *"computation sake"* but are being computer for precisely the exact reasons for Applicants' claims compute derivatives. Further section 2111 of the MPEP clearly states that "Claims must be given their Broadest Reasonable Interpretation", so, the cited portions of the references read on the current claim limitations, given a reasonably broad interpretation of the claim 3.

On page 16 Applicants' argued:

Hoppe does not disclose iso-parameter lines, as claimed. Rather, Hoppe discloses edges of triangles (see, e.g., Figures 5 and 6 of Hoppe). Hoppe merely collapses an edge of a triangle to a single point (see, e.g., Figures 5 and 6 of Hoppe). There are no such edges on parametric surfaces and, therefore, nothing to collapse. Accordingly, it is respectfully asserted that none of the cited references teach or suggest the above-recited limitations of Claims 5 and 14.

The Examiner respectfully traverses Applicants' arguments, Applicants' specification clearly teaches the use of triangles, see figure 4c, therefore a teaching of triangles does not preclude a reference from reading on the claimed limitations of claims 5 & 14.

On page 17 Applicants' further argued :

"The Examiner has cited Hoppe as disclosing the preceding limitations of Claims I0, 11, and 12. The Applicants respectfully disagree.

It is respectfully asserted that a characteristic map does not apply in Hoppe and is thus not disclosed therein. Accordingly, neither is an inverse characteristic map disclosed in Hoppe.

Thus, it is respectfully asserted that none of the cited references teach or suggest the above-recited limitations of Claims 10, 11, and 12."

The Examiner notes that the term MAP appears in several places in *Hoppe* and further figures 24C and 24F appear to be the inverse of each other and therefore the claimed concept of inverse mapping is disclosed in *Hoppe*.

2.6 The previously applied prior art rejections under 35 U.S.C. 103(a) will be maintained.

Claim Objections

3. Claims 1-6, 16 and 17 are objected to because the specification fails to define or provide a written description of a computer readable medium or recording, without a complete definition of the computer readable medium the current system claims appear not have written support in the specification for a computer readable medium.

3.1 Claim 17 is objected to because, lines 6 & 7 of the current claim language reads, "*program code for re-parameterizing of one or more subdivision surfaces of the Catmull- Clark model with a plurality of vertices and at least one extraordinary and...*" and the Examiner believes Applicants' wanted to claim language to recite, "*program code for re-parameterizing of one or more subdivision surfaces of the Catmull- Clark model with a plurality of vertices and at least one extraordinary vertex and...*".

3.2 Claim 17 is objected to because, the claimed program code on a medium is never executed and therefore none of the claimed process steps are ever performed. So while program code is being provided the functions that that code embodies are never actually being executed and therefore the process is never being performed.

3.3 Correction is required.

Claim Rejections - 35 USC § 101

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1-6 and 16 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Independent claims 1, 2 and 16 are claiming systems where the components of the system are a process, the claimed *system* contains only one system element, a computer readable medium, and not the other computer system elements such as a processor and a memory that are *required* to make the system functional. A system without functional elements cannot produce a concrete, tangible and useful result as required by 35 U.S.C. 101, see MPEP section 2106 a portion of which is included here:

"The claimed invention as a whole must >be useful and< *accomplish* a practical Application..."

The Examiner fails to see how Applicants' claimed *system* can *accomplish* a practical Application if the claimed system does not provide a *processor* and a *memory* on which the process steps can be stored and performed.

Claims 3-6 fail to remedy the deficiency as rejected as regards 35 U.S.C. 101.

4.1 Amendment is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1-8 and 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,108,006 to Hoppe in view of "Exact Evaluation of Catmull-Clark Subdivision Surfaces At Arbitrary Parameter Values" to Jos Stam hereafter referred to as *Stam*.

5.1 Regarding independent claims 1, 2, 7, 16 and 17 and using claim 1 as an example, *Hoppe* teaches a computerized system of re-parameterized iso-parametric lines (Figure 4 item 72 and the mesh that is being re-parameterized contains iso-parametric lines see figure 5 & 6 amore specifically item #'s 112 & 118 and the descriptive text) and extraordinary vertices (Figures 5 & 6 items 88, 104 and 106).

However, *Hoppe* does not expressly disclose re-parameterization of Catmull-Clark models.

Stam teaches Catmull-Clark models (page 1 "INTRODUCTION") further and in regards to the natural spacing changing when the iso-parameter lines are being changed, *Stam* discloses (Figure 10 on page 10 which clearly shows that as the degree of the extraordinary vertex changes the natural spacing around the vertex also changes, therefore the natural spacing will change around an extraordinary vertex.)

Hoppe and *Stam* are analogous art because they both come from the same problem solving area free-form surface modeling.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the Catmull-Clark models of *Stam* in combination with the re-parameterization methods of *Hoppe*.

The suggestion for doing so would have been, to provide and easy and efficient method of free-form surface modeling (Abstract page 1 *Stam*).

Therefore, it would have been obvious to combine *Stam* with *Hoppe*to obtain the invention as specified in claims 1-8 and 10-17.

5.2 Regarding dependent claim 3, *Hoppe* does not expressly disclose, *where derivatives are evaluated at one or more parameter values of one or more limit surfaces of subdivision of the Catmull-Clark model approach zero as one or more parameter positions approach the extraordinary vertex.*

However, *Stam* teaches, *"Equation 16 allows us to compute derivatives of the surface up to any order..."* 5th page and regarding the limitation of the *model as it approaches zero* see page 6 the section entitled "5 Implementation".

5.3 Regarding dependent claim 4, *Hoppe* does not expressly disclose, *where derivatives evaluated at one or more parameter values of a limit surface of subdivision of the Catmull-Clark model approach an actual derivative of the limit surface at the extraordinary point as one or more parameter positions approach the extraordinary vertices.*

However, *Stam* discloses, pages 3-5 Mathematical Setting and Eiganstructure, Eiganbases and Evaluation.

5.4 Regarding claims 5 and 14 and using claim 5 as an example, *Hoppe* teaches that *the new spacing decreases as the iso-parametric lines approach one or more extraordinary vertices* (see Figure 5 items f_L, f_R f_{N0} and f_{N2} note that the spacing decreases when the line 112 is inserted).

5.5 Regarding claim 6, *Hoppe* teaches that *where the new spacing decreases as the iso-parametric lines approach one or more of the extraordinary vertices* (Figure 5 note the spacing around point V_U and V_T after line 112 is inserted, the spacing appears to be decreasing around items f_L, f_R f_{N0} and f_{N2}).

5.6 Regarding claim 8, *Hoppe* teaches, *the step of evaluating the re-parameterized surface at one or more parameter positions* (Figure 6 and the descriptive text).

5.7 Regarding claim 10, *Hoppe* teaches, *computing a characteristic map corresponding to each of a face being face vertices, of a quadrilateral mesh containing one or more points being evaluated* (Figure 5 items V_U and V_T, regarding the FACES see Figure 8 item 142) and *computing an inverse characteristic map for each of the vertices* (Figure 6 and the descriptive text) and *blending the inverse characteristic maps of the four vertices to create the re-parameterization* (Figure 6 and the descriptive text, see also Figure 8 and the descriptive text).

5.8 Regarding claim 11, *Hoppe* teaches, *where the characteristic map is used to obtain a continuously differentiable parameterization around one or more extraordinary vertices* (All of Figure 8 and the descriptive text see also figures 11-13 and the descriptive text regarding *differentiable parameterization around one or more extraordinary vertices* see Figure 24F).

5.9 Regarding claim 12, *Hoppe* teaches, *where the inverse characteristic map is computed by locating a layer on the surface* (Figures 5 & 6 and Col. 3 lines 40-51 and Figures 23 & 24 and Col. 24 lines 40-67 and Col. 25 lines 1-7, *the arbitrary mesh representation is functionally the same as the inverse characteristic map*), however, *Hoppe* does not expressly disclose, *a polynomial patch within that layer that contains a point to be evaluated and then computing a re-parameterized position of the input point by polynomial patch inversion.*

Stam teaches *polynomial processing of Catmull-Clark free surfaces* (section 5 "Implimentation").

5.10 Regarding claim 13, *Hoppe* teaches, *blending of the re-parameterizations of two or more vertices* (see Figures 24A thru 27C and the descriptive text).

5.11 Regarding claim 15, *Hoppe* teaches, *the new spacing is uniform as the iso-parameter lines approach one or more extraordinary vertices* (Figure 13A and the descriptive text).

Allowable Subject Matter

6. Claim 9 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

While *Hoppe* teaches parameterization of iso-parametric lines and *Stam* teaches Catmull-Clark surfaces, **none of these references taken alone or in combination with the prior art of record disclose,** $\alpha_k >- (\log_2 / \log\lambda_k)$ where λ_k is the subdominant eigenvalue corresponding to face vertex k and α_k is an exponent parameter of the re-parameterization for file respective face vertex; and blending the re-parameterizations of each face vertex that is re-parameterized, specifically including:

(claim 9) "...$\alpha_k >- (\log_2 / \log\lambda_k)$ where λ_k is the subdominant eigenvalue corresponding to face vertex k and α_k is an exponent parameter of the re-parameterization for file respective face vertex; and blending the re-parameterizations of each face vertex that is re-parameterized...", **in combination with the remaining elements and features of the claimed invention.**

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dwin M. Craig whose telephone number is (571) 272-3710. The examiner can normally be reached on 10:00 - 6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul L. Rodriguez can be reached on (571) 272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000..

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